

# RS-232 to RS-485 Converter



## User Guide (Version 1.02)



**The Embedded Solutions Company**

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Equinox guarantees that its products will be free from defects of material and workmanship under normal use and service, and these products will perform to current specifications in accordance with, and subject to, the Company's standard warranty which is detailed in Equinox's Purchase Order Acknowledgment.

## Equinox Warranty Information

This product is guaranteed by Equinox Technologies UK Limited for a period of 12 months (1 year) after the date of purchase against defects due to faulty workmanship or materials. One guarantee covers both parts and labour. Service under the guarantee is only provided upon presentation of reasonable evidence that the date of the claim is within the guarantee period (e.g. completed registration/guarantee card or a purchase receipt).

The guarantee is not valid if the defect is due to accidental damage, misuse or neglect and in the case of alterations or repair carried out by unauthorised persons. A number of exceptions to the warranty are listed in the 'Exceptions to warranty' section below. Service (during and after guarantee period) is available in all countries where the product is distributed by Equinox Technologies UK Limited.

### Exceptions to warranty

i. **Over-voltage damage**

This warranty does not cover damage to the programmer due to voltages beyond the specified voltage limits being applied to the 'DC Power Input' or the 'Target Connector'. The user must ensure that sufficient care is taken to avoid over-voltage and static conditions on any of the 'Target Connector' I/O pins.

ii. **Over-current damage**

This warranty does not cover damage to the programmer due to excessive current being drawn from the programmer power supply. The user must ensure that there is sufficient over-current protection within the test fixture to protect against short circuit loads.

iii. **Short-circuit damage**

This warranty does not cover damage to the programmer due to short-circuit loads being placed across programmer I/O lines.

### Fixed price repair service

Equinox offer a fixed price repair service for the PPM programmer. Please contact Equinox directly for further information.

### Disclaimer

Whilst every effort has been made to ensure that programming algorithms are correct at the time of their release, it is always possible that programming problems may be encountered, especially when new devices and their associated algorithms are initially released. It is Equinox's Company Policy to endeavour to rectify any programming issues as quickly as possible after a validated fault report is received.

It is recommended that high-volume users always validate that a sample of a devices has been programmed correctly, before programming a large batch. Equinox Technologies UK Ltd. can not be held responsible for any third party claims which arise out of the use of this programmer including 'consequential loss' and 'loss of profit'.

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Equinox Technologies UK Ltd. can not be held responsible for any programming problems which are 'out of our control'. This type of problem is usually listed in the 'Errata Sheet' for the particular device being programmed and is available from the silicon vendor.

Information contained in this manual is for guidance purposes only and is subject to change. E&OE.

## Electromagnetic Compatibility (EMC) Compliance

The '**RS-232 to RS-485 Convertor**' is a CE Approved Product. It is designed for use in an ESD controlled environment i.e. development or production. This means, therefore, that the user must ensure that there is no possibility of damage from electrostatic discharge (ESD). Since the devices and equipment to which this product is likely to be connected may well themselves be susceptible to ESD, this should not pose any difficulty.

For example, if you are handling microcontrollers and EEPROMS etc. then you will already be used to appropriate precautions, such as the use of anti-static mats, wrist straps and so on. You should treat your '**RS-232 to RS-485 Convertor**' with the same care as you would these type of device. Always ensure that you are not yourself carrying a static charge before handling the product. Wearing an earthed anti-static wrist strap is recommended.

Equinox have taken great care in designing this product to be compliant with the European EMC directive. When using the equipment be sure to follow the instructions provided. Although RF emissions are within prescribed limits, care should be taken if you are using the product near to sensitive apparatus. If you experience any difficulty please refer to Equinox technical support.



### ESD Points to remember

- Work in a static-free environment.
- Wear an earthed wrist strap when handling either the programmer and/or any programmable device.

## Technical Support

It is often the case that users experience problems when installing or using a product for the first time. Equinox are unable to answer technical support questions about this product or its use by telephone.

**If you have a technical support problem, please consult the following list for help:**

? **Manual**

? **On-line help**

Press <F1> for help at any time.

The help system is context-sensitive. Simply press <F1> on any error message and the Possible causes of the error should be listed. This help system is updated on a regular basis. Please see software update details for information on keeping up-to-date with software revisions.

? **Internet Web Site**

Equinox have setup an AVR™ microcontroller support page on our web site. This page is designed to provide up-to date information on all issues concerning both AVR™ microcontrollers and support tools.

The microcontroller support page can be found at: [www.equinox-tech.com](http://www.equinox-tech.com)

? **E-mail**

Please e-mail any technical support questions about this product to:

[support@equinox-tech.com](mailto:support@equinox-tech.com)

Equinox will try our best to answer your questions about this product as quickly as possible. However, we cannot promise an immediate reply. Please consult our web site for new software updates as the problem that you are enquiring about may have already been fixed in a new version.

? **Fax**

Please fax any technical support questions about this product to: +44 (0) 1204 535555

Equinox will try our best to answer your questions about this product as quickly as possible. However, we cannot promise an immediate reply. Please consult our web site for new software updates as the problem that you are enquiring about may have already been fixed in a new version.

## Associated Product Documentation

This manual provides a detailed description of the 'RS-232 to RS-485 Convertor' hardware only. For detailed information about the systems in which this module is used and the associated hardware modules and software support products, please refer to the sources of information listed in the table below.

<b>Hardware:</b>	
<b>Product</b>	<b>Documentation</b>
PRO101 Programming System	Overview \ Getting Started Manual
PRO104/108 Programming System	Overview \ Getting Started Manual
PPM Module	Reference Manual
PPM Firmware Update Instructions	User Manual
ISP Interface Module	Reference Manual
RS-232 to RS-485 Convertor	User Manual
ISP Connections for Atmel AVR and AT89S Microcontrollers	Please refer to separate Application Articles for each device family.
<b>Software:</b>	
EQTools	Installation and Getting Started Guide
EQTools	Help file
ISP-PRO	Installation and User Manual
EQTools/ISP-PRO – Error Messages	Reference Manual - Updated on a regular basis – please download the latest version from our Web Site.
Labview – Remote Application Control	User Manual Describes how to control the PPM using a custom Labview (from National Instruments) application.
Remote Application Control	User Manual Describes how to control the PPM using a custom Remote Application written in e.g. Visual Basic, C++, C Builder, Delphi etc.

### Downloading up-to-date documentation and software:

In line with our policy of continuous improvement, the software and associated documentation for this product are updated on a regular basis. Please refer to the 'ISP Support Page' at [www.equinox-tech.com/isp.htm](http://www.equinox-tech.com/isp.htm) for the most up-to-date information for this product.





## 1.0 Overview

The RS-232 to RS-485 Convertor module converts RS-232 levels from a PC COM port to RS-485 levels suitable for interfacing with the Equinox PRO101, PRO104 and PRO108 Production ISP programmers. The module provides an optical isolation barrier between the PC COM port and the RS-485 bus which serves to protect the PC from ESD damage.

### 1.1 System Contents

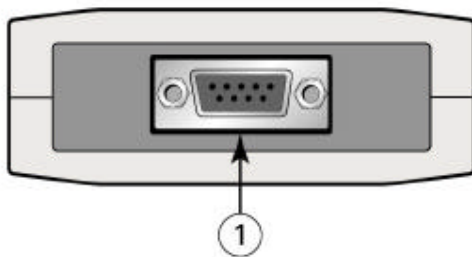
The RS-232 to RS-485 module package should contain the following items:

Quantity	Item description
1	RS232 – RS485 Convertor Module
1	Mains – DC Switchmode Power Supply Adaptor  <b>Order code:</b> <b>Mains Input Voltage &amp; plug type (Vrms):</b> RS485-C1(UK)                      UK 3-pin 240V @ 50Hz RS485-C1(EU)                      Euro 2-pin 230V @ 50Hz RS485-C1(US)                      US 2-pin 110V @ 60Hz RS485-C1(AS)                      ASIA 3-pin 240V @ 50Hz  <b>Output voltage:</b> +9.0V DC (regulated) @ 1.5A
1	9-way D to 9-way D PC Serial Cable (1.5m)
1	9-way D to 25-way D PC COM Port Adaptor
1	RJ11 RS485 flat cable (1.5m)
1	RJ11 RS485 flat cable (0.5m)
1	User Manual (RS232 to RS485 Convertor)

Figure 1

## 2.0 RS232-RS485 Convertor End Panels

RS-232 to RS-485 Convertor  
(Front Panel)



RS-232 to RS-485 Convertor  
(Rear Panel)

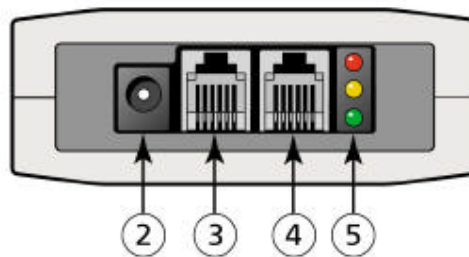


Figure 2

Number	Description	Type
1	RS-232 Connector	DB9 Female
2	Power Connector	2.5mm Power Connector
3	RS-485 Connector	RJ11
4	RS-485 Connector	RJ11
5	Traffic Light Status LED's	3-way LED pack

Figure 3

## 2.1 RS-232 to RS-485 Status LED Indicators

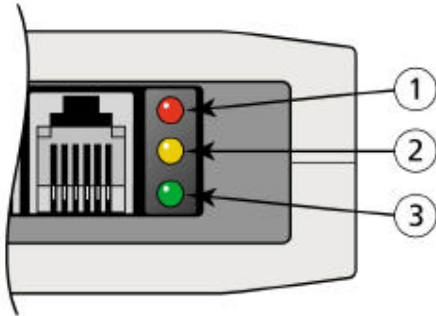


Figure 4

No	LED Colour	Status Description
1	Red	Indicates that the PC has enabled RS-485 transmission. This means that the RS-485 driver has been enabled allowing the convertor to drive the RS-485 line to the remote system.
2	Yellow	Indicates that the remote RS-485 system is transmitting data to the PC through the convertor. The LED will flash when data is being transmitted.
3	Green	PC is transmitting data to the remote RS-485 system. The LED will flash when data is being transmitted.

Figure 5

## 2.2 Input Power Supply Requirements

The power supply requirements for the 'RS-232 to RS-485 Convertor Module' are detailed in the table below. The current drawn by the module from the external power supply varies from a Standby Current when no data transfer is taking place to an Active Current when data transfer is taking place.

Parameter	Values			Units
	Min	Typical	Max	
Standby Current		10		mA
Active Current			1000	mA
Supply Voltage	8.3	9.0	9.9	V DC

Figure 6

## 2.3 J1 RS-232 Serial Communications Port

**Connector type:** 9-Way Male D Connector (Female)  
**Purpose:** Connects to PC COM port (RS-232)

This connector is an RS-232 serial port which connects to a spare RS-232 PC COM (serial) port. The pin-out of this connector is detailed in the table below. The 'RTS' pin must be asserted by the PC COM port in order to enable the RS-485 line driver.

### J1 Pin-out:

Pin No.	Title RS232	Description RS232
1	DCD	Not Connected
2	RXD	Receive
3	TXD	Transmit
4	DTR	Not Connected
5	0 Volt	0V
6	DSR	Not Connected
7	RTS	RS-485 Transmit ENABLE The PC must assert this signal line in order to enable the RS-485 line driver to allow communications from the PC to the remote RS-485 system.
8	CTS	Not Connected
9	RING	Not Connected

Figure 7

## 2.4 J2 & J4 Isolated RS-485 Connectors

**Connector type:** FCC68 Socket 6-Way (Accept RJ11 plugs)

**Purpose:** Connects to RS-485 remote system e.g. PRO101/4/8 programmers

These two connectors are opto-isolated RS485 connectors for communicating with the remote RS-485 system(s). The connectors are wired in parallel so each socket is the same as the other. The '**RS-232 to RS-485 Convertor Module**' is supplied with two RJ11 flat cables for connecting between this module and the RS-485 remote system.

### J2 & J4 – RS485 Connector Pin-outs:

Pin No.	Title	Description
1	TX+	Transmit +
2	TX-	Transmit -
3	RX+	Receive+
4	RX-	Receive-
5	GND	0V
6	GND	0V

Figure 8

## 3.0 PRO101 – Multi-Channel RS-485 Operation

### 3.1 Overview

It is possible to network up to 16 PRO101 programmers on an RS-485 network and control them from a single 'Supervisor PC' running a single session of the EQTools/ISP-PRO software. This scenario requires that each PRO101 programmer is set to 'RS-485' and that a unique 'Node Address' is set for each programmer. An RS-232 to RS-485 convertor is required to convert the RS-232 signal from the PC COM port to an optically isolated RS-485 signal suitable for interfacing with the PPM's on the network.

The typical setup is shown in the figure below:

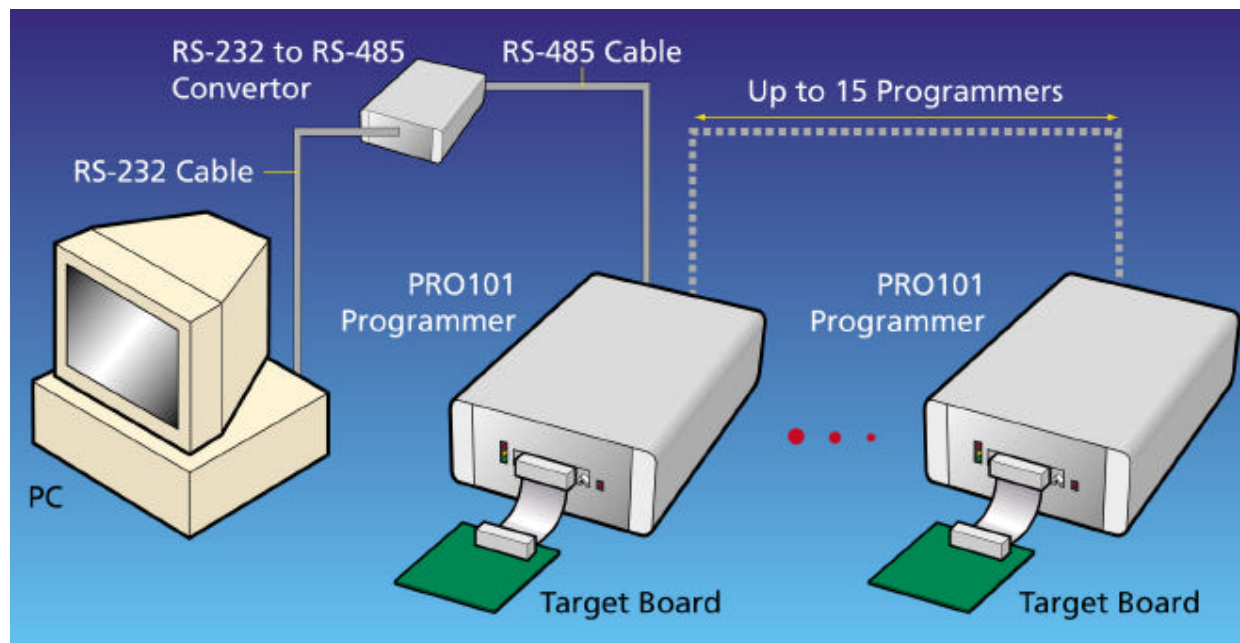


Figure 9

## 3.2 PRO101 Hardware Installation Instructions

- Place the PRO101 programmers side-by-side on a flat surface allowing sufficient space in front of each programmer to place the 'ISP Interface Modules' and 'Target Systems'.
- Remove the lid of each programmer by removing the four screws in the lid.
- Set the 'Communications Mode Switch' (S2) to 'RS-485'.
- Set the Communications Node Address to the required unique address (0 to 15).
- Plug the 9-way RS-232 cable into the port on the RS-232 to RS-485 convertor and connect further PRO101 programmers as shown in the diagram below.

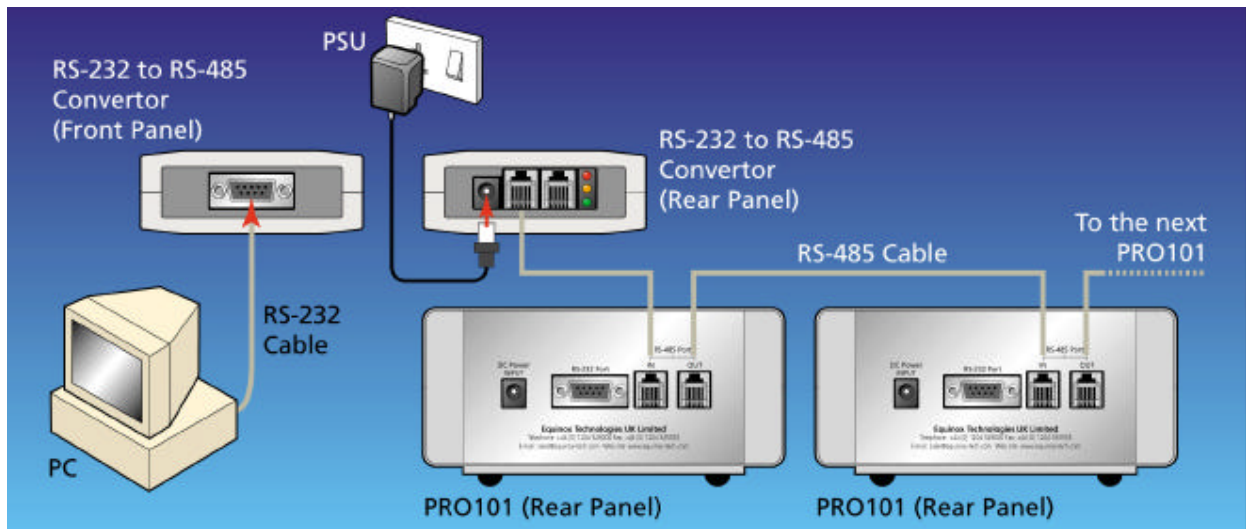


Figure 10

- Plug an RS-485 network cable from one of the RS-485 outputs on the RS-485 convertor to the 'RS-485 Input' connector on the rear panel of the first PRO101.
- Plug another RS-485 network cable from the 'RS-485 Output' connector on the rear panel of the first PRO101 to the next PRO101 in the chain.
- A return RS-485 cable from the last PRO101 in the chain to the RS-485 convertor is NOT required.
- Power up the PC.
- Plug in the power supply adaptor supplied with the RS-232/RS-485 convertor into a spare mains socket.
- Power up all PRO101 programmers.
- Launch the ISP-PRO software on the PC and set up the required number of PPM's within the software.
- Test that all PPM's are communicating with the PC at their correct 'Node Address'. (The Node Address may be changed while the programmer is powered up).
- When all PRO101's are recognised by the ISP-PRO software, power down all programmers and replace lids.



## 4.0 PRO104 – 4 Channel Eurocard Rack Production ISP System

### 4.1 Overview

The PRO104 programmer contains 4 PPM programming modules on an RS-485 network. These are controlled from a single 'Supervisor PC' running the ISP-PRO software. An RS-232 to RS-485 convertor is required to convert the RS-232 signal from the PC COM port to an optically isolated RS-485 signal suitable for interfacing with the PPM's on the network. It is possible to expand from 1 up to 4 PRO104's (16 PPM Boards in total).

The typical setup is shown in the figure below:

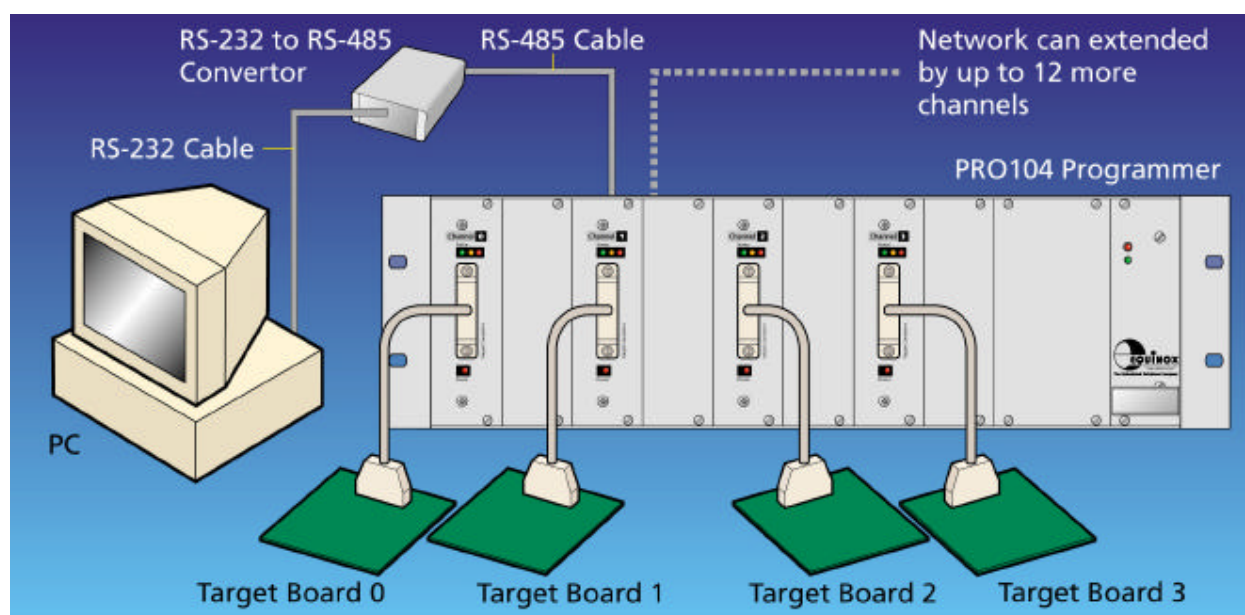


Figure 11

## 4.2 PRO104/108 Hardware Installation Instructions

- Place the PRO104/108 programmer(s) on a flat surface allowing sufficient space in front of each programmer to place the 'ISP Interface Modules' and 'Target Systems'.
- Plug the 9-way RS-232 cable into the port on the RS-232 to RS-485 convertor.

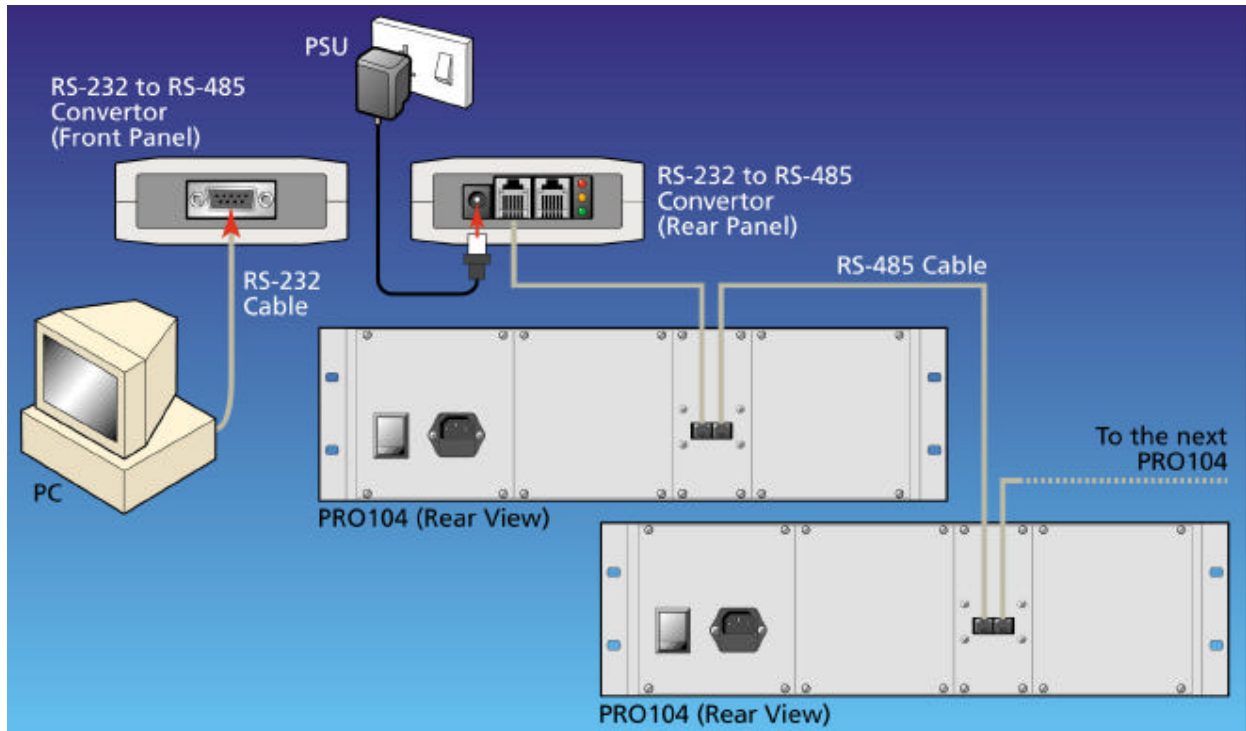


Figure 12

- Plug an RS-485 network cable from one of the RS-485 outputs on the RS-485 convertor to the 'RS-485 Input' connector on the rear panel of the first PRO104.
- Plug another RS-485 network cable from the 'RS-485 Output' connector on the rear panel of the first PRO104/108 to the next PRO104/108 in the chain.
- A return RS-485 cable from the last PRO104/108 in the chain to the RS-485 convertor is NOT required.
- Power up the PC
- Power up the PRO104/108 programmer(s)
- Launch the ISP-PRO software on the PC and set up the required number of PPM's within the software
- Test that all PPM's are communicating with the PC at their correct 'Node Address'. (The Node Address may be changed while the programmer is powered up).